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THE STUDY OF INSECTS.

A Manual for the Study of Insects. By Prof. John Henry Comstock and Anna Botsford Comstock. Pp. 701. (Ithaca, N.Y.: Comstock, 1895.)

THE present work is very much on the same lines as Dr. Packard's well-known "Guide to the Study of Insects," though somewhat more popular, and dealing still more exclusively with North American entomology, of which, on the whole, it furnishes an admirable compendium. It is got up in a very attractive form, and is crowded with illustrations, the woodcuts being chiefly from engravings from nature by Mrs. Comstock.

The first chapter is devoted to a brief explanation of the principles of zoological classification and nomenclature, in the course of which we meet with a system of trinomial nomenclature for sub-species, or constant varieties, which has not hitherto been much patronised by entomologists. Thus, with reference to a common American swallow-tail, Prof. Comstock writes:

> "This name, *Jasoniades glaucus*, is used when reference is made to the species as a whole. But if one wishes to refer to the black form alone, it is distinguished as *Jasoniades glaucus glaucus;* while the yellow form is distinguished as *Jasoniades glaucus turnus.*"

Surely this is too complicated and clumsy a system for ordinary use!

The second chapter deals with "Insects and their near relatives," and includes a brief definition of the branch (or, as it is more commonly called in England, subkingdom) Arthropoda, and a table of the four classes *Crustacea*, *Arachnida*, *Myriapoda*, and *Hexapoda*, or insects. The *Crustacea* and *Myriapoda* are very briefly noticed, though a few typical forms of each are figured; but the *Arachnida* receive more attention, the orders and principal families, especially of the *Araneida*, being briefly discussed, with notices of their chief peculiarities and habits. As an illustration of the author's style in the more popular parts of his book, as well as embodying a curious phase of cannibalism, we may quote the following passage from p. 24:—

> "Fig. 23 represents the large egg-sac of one of the cobweavers. This is made in the autumn, and contains at that season a large number of eggs—five hundred or more. These eggs hatch early in the winter; but no spiders emerge from the egg-sac until the following spring. If egg-sacs of this kind be opened at different times during the winter, as was done by Dr. Wilder, the spiders will be found to increase in size, but diminish in number as the season advances. In fact, a strange tragedy goes on within these egg-sacs; the stronger spiders calmly devour their weaker brethren, and in the spring, those which survive emerge sufficiently nourished to fight their battles in the outside world."

The remaining chapters are taken up with a sketch of the seventeen orders of insects admitted by Prof. Comstock, with special, and indeed almost exclusive, reference to the North American species. These chapters differ very much in length and importance, the space allotted to some of the smaller orders being barely a couple of pages, while the chapter on *Lepidoptera* alone occupies nearly a third of the volume.

The interest of the book is much enhanced by the illustrations; and in speaking of the *Membracidæ*, one of the families of *Homoptera*, Dr. Comstock observes: "Nature must have been in a joking mood when treehoppers were developed"; and the row of "odd fellows" at the foot of p. 154, where this observation occurs, fully bears out the remark.

But it must not be supposed that this book is too popular to appeal to serious students; far from it. Some of the smaller orders of insects are, indeed, passed over with but slight notice; but in the larger ones, we meet with elaborate descriptions of structure, and dichotomous tables of the principal families, which are afterwards discussed in greater detail, and in most cases one or more of the representative American species are figured, frequently with transformations.

Although, as a rule, America suffers more from insect pests than Europe, yet there seem to be exceptions which we should hardly anticipate. Thus Prof. Comstock informs us (p. 103) that "The earwigs are rare in the North-Eastern United States, but are more often found in the South and on the Pacific coast," and the native American cockroaches also are regarded by him (p. 106) as harmless, the destructive species, as in England, being all imported insects. Among these, he mentions the "Croton Bug," as he calls *Phyllodromia germanica*, as infesting "the vicinity of the pipes of the water-systems of many of our cities." In England, this species is particularly numerous in bakeries.

Under the *Fulgoridæ* (Lantern-flies), Prof. Comstock refers to "the fact that they are phosphorescent," apparently being unaware that the statement is very greatly doubted, though it is perhaps premature to say that it has been actually disproved.

A great many figures of neuration of *Lepidoptera* and other insects are given, all numbered according to a uniform system which Prof. Comstock has adopted from Redtenbacher, with modifications of his own, but which is unfortunately not fully explained in the work before us.

English names are given to most of the insects noticed, some of them being rather grotesque. Thus, at p. 274, we find a figure of "The Firstborn Geometer" (*Brephos infans*), with the explanation on the following page: "As this is probably the most primitive geometer occurring in our fauna, we suggest the popular name Firstborn for it." This is not the first occasion on which we have had occasion to animadvert on the introduction of crude speculations on the course of evolution, as if they were established or probable facts.

It is perhaps worth noticing that Prof. Comstock places the *Lepidoptera* between the *Myrmeleonidæ* and the *Diptera*. He has a peculiar classification of his own, which we have not space to indicate in detail; but he makes the *Hepialidæ* and *Micropterygidæ* a separate sub-order under the name of *Jugatæ*, and after it he places the *Frenatæ*, in which he includes all the remaining families, commencing with the *Megalopygidæ*, *Psychidæ*, *Cossidæ*, &c., and ending with the "super-family" *Saturniina*, the "families" *Lacosomidæ* and *Lasiocampidæ* (apparently not referred to any "super-family"), and the butterflies, including the "super-families" *Hesperiina* and *Papilionina*, in a reversed order, terminat-

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ing with the Nymphalidæ, sub-family *Satyrinæ*. In the butterflies, Dr. Scudder has been chiefly followed.

The family *Papilionidæ* supplies us with an illustration that the book is only written primarily for American students; for the *Papilioninæ* are distinguished by the black ground-colour, the tail, and the five-branched radius of the fore-wings; and the *Parnassiinæ* by the white tailless wings and four-branched radius, characters not universally exact, though amply sufficient to distinguish the North American forms.

A curious fact is noticed by Prof. Comstock with reference to the Garden Whites. He tells us that the native American species—*Pieris oleracea* and *Pontia protodice*—have both become greatly lessened in numbers by the increase of the imported European *Pieris rapæ*.

Another curious fact noticed by Prof. Comstock is that the dog-flea is the common flea of the United States, the true *Pulex irritans* being comparatively rare; while the importance of counter-checks in agricultural entomology is illustrated by the author's remark: "Nothing more wonderful has been accomplished in economic entomology than the subduing in California of the cottony-cushion scale by the introduction from Australia of a lady-bug, *Vedalia*, which feeds upon it."

We cordially commend Prof. Comstock's book to European, and especially to British, entomologists: for, although it is written mainly for American students, it contains much which entomologists of other nations will find both useful and instructive. W. F. K.

AGRICULTURE AND HORTICULTURE.

Agriculture, Practical and Scientific. By James Muir, M.R.A.C. Pp. 350. (London: Macmillan, 1895.)

Agriculture. By R. Hedger Wallace. (London and Edinburgh: W. and R. Chambers, 1895.)

The Horticulturist's Rule-Book. By L. H. Bailey. Third edition. (London and New York: Macmillan and Co., 1895.)

PROF. MUIR'S neat and presentable volume is the latest claimant upon the indulgence of the agricultural public, the number of readers—and what is more to the point, the number of students—amongst whom is undoubtedly steadily increasing. Commencing with a discussion of the plant, the author speedily falls back upon the soil as the staple of his discourse, though parenthetically he introduces a chapter on plant food in the soil. Then we get the inevitable section on the British geological formations, which has about as much relation to the living art of agriculture as a list of our kings and queens has to a true understanding of English history. Drainage, irrigation, and other processes for ameliorating the soil are next discussed, and then half a dozen chapters are devoted to the important subject of manures. Implements and machines are next briefly glanced at, and the remainder of the book is occupied by chapters on the chief crops of British agriculture. We believe that, well-worn as the theme is, there is still room for novelty in the treatment of agriculture as a book subject, but Prof. Muir does not appear to have hit upon it.

Live-stock constitute the backbone—the sheet-anchor—of British agriculture, and to omit all reference to this indispensable section of our greatest national industry in a book bearing the comprehensive title of the volume under notice, is a blemish upon the work. No one would ever infer from its name that the volume is silent upon the great subject of sheep husbandry, which has become so inextricably—and we may add so advantageously—interwoven with the arable farming of this country. Nor would any one expect, in a book on "Agriculture, Practical and Scientific," to find no allusion to the milk-pail and the cows that fill it, and no mention of the butter and cheese industries. The author recognises that agriculture embraces "the breeding, feeding, and management of all kinds of farm live-stock," but it is not till the reader begins perusing its pages, that he learns that the work "will not attempt to deal with" this part of the subject. In this matter, the author had nobody but himself to please, and all we venture to say is that the title of the volume should have fitted its contents. A work on "agriculture" that ignores live-stock might fairly be compared to a treatise on chemistry that made no mention of carbon.

The part of the work that is best done is that relating to crops, and had Prof. Muir chosen to confine himself to this branch of farming, he would not have acted unwisely. His skilful treatment of this section of the subject serves to revive the recollection of John Wilson's admirable work in the middle of the century. But the most important cropping of all—that of grass land—is inadequately treated, though it is abundantly evident, from the few pages allotted to this subject, that the author might usefully have given more space to it at the expense of one or two perfunctory chapters which would not have been missed. The processes of hay-making and ensilage are well described, yet here again the idea arises that the author felt he was approaching his limits, and the result is that he appears to exercise a restraint which we feel sure has operated to the disadvantage of the reader. A feature of the work that will be much appreciated is that it reproduces in a handy form many of the tabular statements that have from time to time been published in the *Journal* of the Royal Agricultural Society of England. Three dozen illustrations accompany the text, and those of seeds are particularly noteworthy for their fidelity.

Commending the book, then, for its trustworthy treatment of farm crops, we may notice one or two features that seem to call for criticism. The index is sometimes relied upon for the introduction of terms not given in the text. Thus, "nitrification" is indexed as dealt with at page 25, turning to which the reader finds the process described, but no name given to it, unless perchance the term "oxidation" is inadvertently used instead. Other similar cases occur. A highly important subject to farmers, the temperature of germination, is surely awarded scant treatment when it is dismissed in the brief paragraph: "The temperature most favourable to germination varies in the seeds of different plants." Such frequent recourse is made by the author to the work of Lawes and Gilbert, that it is regrettable he did not imitate the consistency with which they employ the term "nodules" to denote the outgrowths on the roots of papilionaceous plants. The repeated use of the word

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